Five Lakes Watershed Management Plan
FINAL REPORT

Lagrange and Noble Counties, Indiana

July 25, 2006

Vision: Clean lakes, rivers and lands which provide a strong economic base and excellent quality of life for present and future generations.

Mission: To promote stewardship of the watershed and its resources to ensure sustainable watershed, functions, and uses for optimal conservation and economic benefits

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1.0 INTRODUCTION

1.1 Five Lakes Conservation Association was the principal organization involved in developing the 319 funding proposal, securing the matching contribution and contracting with the IDEM. D.J. Case and Associates (DJCase) was subcontracted for the coordination, facilitation and implementation of the planning process. J. F. New & Associates (JFNew) was subcontracted for the implementation of the water quality, habitat, and biological assessment.

Development of this watershed management plan grew out of efforts of the Five Lakes Conservation Association (FLCA). In 2002, the FLCA began working with a private consulting firm to determine what steps they could take to address non-point sources of pollution within the Five Lakes watershed which would eventually translate to improved water clarity and quality within the lakes. At the same time, the FLCA contacted regional watershed conservationists from the Indiana Department of Environmental Management (IDEM) and the Indiana Department of Natural Resources (IDNR) to determine methods to catalog water quality and watershed problems and identify potential projects which could be implemented to address these problems. Both the private consultant and the regional watershed conservationists encouraged the FLCA to develop a watershed management plan with input from all 24 lakes within the watershed and the entire community since the process of the developing a plan is designed to help watershed stakeholders understand each stakeholder's concerns and find common ground in resolving these concerns. With this in mind, the FLCA applied for and successfully secured a Section 319 grant from the United States Environmental Protection Agency (EPA) through IDEM's Section 319 grant program to develop a watershed management plan.

The plan details the current and historical condition of the watershed through a review of historical reports and sampling the biological, chemical, and physical condition of waterbodies in the watershed. More importantly, the planning process provided a forum for watershed stakeholders to discuss their water quality concerns related to the waterbodies in the Five Lakes watershed and develop an action plan to address those concerns. This plan documents the stakeholders' concerns and vision for the future of the Five Lakes watershed. It outlines the stakeholders' strategies and action items selected to achieve their vision. Finally, the plan includes methods for measuring stakeholders' progress toward achieving their vision and timeframes for periodic refinement of the plan. Ultimately, the plan serves to guide and educate the stakeholders on the importance of improving water quality in the Five Lakes watershed.

2.0 DOCUMENTATION OF CONTRACT DUTIES

2.1 Four contract duties were required to be fulfilled as part of the Five Lakes watershed management plan. These four duties and the activities that took place in order to accomplish each duty are as follows:

DUTY A: Develop a watershed management plan for the Five Lakes Watershed. The Contractor shall develop a Watershed Management Plan (WMP) for the Little Elkhart Creek-Messick-Oliver Lake, the

Little Elkhart Creek-Dallas Lake, and the Little Elkhart Creek-Tamarack-Creek Lakes watersheds. The WMP shall include all elements listed in the State's "Watershed Plan Checklist". The Contractor shall provide one (1) hard copy and two (2) electronic copies compatible with State software of the WMP to the State, and make copies available to local libraries, local officials, and land use planners in the watersheds, and everyone on the plan distribution list. A copy of the draft plan will be submitted to the State for review and approval no less than two (2) months prior to the contract end date. To begin this process, the Contractor shall identify and coordinate a Watershed Planning Team consisting of individuals from the three watersheds, as well as a Contractor representative and technical support experts to identify issues and concerns to be considered during the planning process. The Contractor shall assist the team in the development of a mission statement, goals, and objectives for the draft WMP. The Contractor shall use public comments and results of water quality, habitat, and biological monitoring, as well as the concurrently developed feasibility study to guide WMP development. The Contractor shall coordinate with the project leader of the concurrently-developed feasibility study of these three watersheds.

Activities

Historical information for the watershed plan was collected throughout the course of the grant. This includes land use data from the U.S. Geological Survey; water quality data from the Indiana Department of Environmental Management (IDEM), Indiana Clean Lakes Program; and volunteer monitors; biological monitoring data from IDEM; endangered species data from IDNR, Division of Nature Preserves, and agricultural data from IDNR. Additional information was collected about the use of conservation practices in the watershed, climate information from Lagrange and Noble Counties, population information from the U.S. Census Bureau, and historical and cultural information from the Lagrange and Noble County Historical Societies.

Historical information, land use data, water quality data, biological monitoring data, endangered species data, and appropriate GIS maps were synthesized and included in the watershed characteristics section of the watershed management plan. Documented concerns, key reference documents, a water quality summary, an identified problem summary, a list of goals, a summary of the decision-making process, and methods for measuring success were also included in the watershed management plan. The action register, potential funding sources, and historic and current water quality graphs and data were added as appendices to the draft watershed management plan.

The watershed management plan incorporated all public input provided. A draft report was submitted to IDEM February 2, 2006. Comments from IDEM were received after that point and were incorporated into a number of drafts. The final draft was submitted to IDEM on July 25, 2006. Once IDEM has made their final comments, a final version of the Five Lakes watershed management plan will be placed in the Lagrange and Wolcottville Public Libraries.

DUTY B: The Contractor shall conduct community outreach regarding the development of the WMP. This shall include the development and distribution of outreach materials for the community that describe the project. The outreach materials shall consists of no less than quarterly newsletters or newspaper articles, and separate newspaper announcements of dates, times, and places of activities, meetings, and events scheduled within the watersheds during the contract term. The Contractor shall provide two (2) copies of all developed outreach materials to the State. The Contractor shall hold no less than eight (8) public meetings to ensure that all stakeholder prospectives are considered in the development of the WMP.

Activities
The public meetings were announced in local newspapers, radio stations, and with posters located in community gathering places that had community bulletin boards. Additionally, a flyer was distributed to over 900 watershed residents describing the process and inviting them to attend public meetings. All stakeholders and the general public were invited and encouraged to attend public meetings. Public meetings were held on February 26, 2004; May 25, 2004; July 28, 2004; October 14, 2004; December 10, 2004; May 19, 2005; July 21, 2005; and September 15, 2005. These meetings were used to solicit information on watershed stakeholder's concerns, develop problem statements and goals, determine goal prioritization, and complete the action register. All comments from watershed stakeholders on the draft watershed management plans were also gathered at this time.

DUTY C: The Contractor shall collect and review historical water quality data in the watersheds and determine the locations where any water quality or macroinvertebrate samples were taken. The Contractor shall use Geographic Information Systems (GIS) to map the watersheds and existing data to provide for spatial analyses and communication with stakeholders and the Watershed Planning Team. All GIS data created or modified by the Contractor for deliver to the State shall meet the Indiana State Agencies Arc/Info Data Collection Standards except for metadata. Metadata shall meet the Federal Geographic Data Committee (FGDC) standard called the Content Standard for Digital Geospatial Metadata. Any deviation from either standard must have prior approval from the State. All GPS data collected by the Contractor for delivery to the State shall include the State's method Accuracy Description Codes. Any deviation from this requirement much have prior approval from the State.

The Contractor shall conduct a monitoring program that includes stream water quality sampling at a minimum of seven (7) sites for a minimum of three (3) times (spring, summer, fall) at normal flow and one (1) time at storm flow. The water quality sampling parameters shall include, but not be limited to, nitrate, ammonia, total Kjeldahl nitrogen, total suspended solids, turbidity, total phosphorus, soluble reactive phosphorus, pH, dissolved oxygen, and temperature. The Contractor shall conduct stream macroinvertebrate sampling at a minimum of seven (7) sites not less than one (1) time at each site and analyze the colleted community using the State's macroinvertebrate Index of biotic Integrity (mIBI), and conduct habitat assessment during the biological sampling activities by using the State's Qualitative Habitat Evaluation Index (QHEI) interpretation of data. The Contractor shall submit all collected data and Quality Assurance information to the State in hard copy and electronic format compatible with State software.

Activities
As described above, historical water quality, water-quality related, and watershed data was collected from a variety of sources. The Indiana Department of Environmental Management Assessment Branch, Indiana Department of Natural Resources Division of Fish and Wildlife, Indiana Clean Lakes Program, U. S Geological Survey, U.S. Environmental Protection Agency Storet database, Lagrange and Noble County SWCDs, Lagrange and Noble County Health Departments, and Hoosier Riverwatch were all queried for water quality or water-quality related data. All available data was included as a basis for initial watershed concern identification. Watershed stakeholders also provided information in the form of memories and watershed concerns. The Five Lakes Conservation Association and the two SWCDs provided historical watershed-level information in regards to work that was previously completed in this watershed. All historical water quality, water quality-related and watershed data was used as a basis for the Five Lakes watershed management plan. All relevant information was synthesized into GIS-based maps, where appropriate.

Sampling consisted of the collection of samples from the six (6) main tributaries in the watershed (Cree Lake outlet, South Milford tributary, Adams Lake outlet, Oliver Lake outlet, Hutchins Ditch, and Uhl Ditch) and at two locations along the main stream (Little Elkhart Creek) to assess the physical, biological, and chemical compositions of the streams. Sampling was conducted twice during base flow and twice storm flow conditions. This deviated from the contract; however, permission was granted by the IDEM Project Manager prior to the second storm flow sample collection event occurring. Samples were analyzed for temperature, pH, dissolved oxygen, turbidity, total suspended solids, soluble reactive phosphorus, total phosphorus, nitrate-nitrogen, ammonia-nitrogen, and total Kjeldahl nitrogen. Additionally, macroinvertebrate samples were collected and habitat assessed at each of the eight stream sites. These data were utilized to calculate the macroinvertebrate index of biotic integrity and the Qualitative Habitat Evaluation Index.

All samples were collected and analyzed according to the procedures outlined in the QAPP. Data collected for the grant can be found in the appendices included with the Five Lakes watershed management plan. Appendix H of the plan highlights water quality sampling results including water chemistry, macroinvertebrate, and habitat assessments.

DUTY D: The Contractor shall develop a Quality Assurance Project Plan (QAPP) for all monitoring activities and submit it to the State for approval no less than one (1) month prior to initiating monitoring activities. The Contractor shall conduct all monitoring activities in accordance with the approved QAPP.

Activities
The final Quality Assurance Protection Plan (QAPP) was verbally approved in April 2004 and written approval was received June 12, 2004. The QAPP was amended to change one sampling location (Site 7) and add two sampling events. This amendment was approved August 17, 2004. Laboratories for sample analysis were chosen and their quality control procedures were incorporated into the QAPP. Sample locations were identified and field checked. Sample locations were finalized with landowner approval.

3.0 PROJECT RESULTS

3.1 The development of the Five Lakes watershed management plan was guided by the following vision.

Clean lakes, rivers and lands which provide a strong economic base and excellent quality of life for present and future generations.

This vision serves as the foundation for the Five Lakes Watershed Management Plan. Watershed stakeholders selected their mission

To promote stewardship of the watershed and its resources to ensure sustainable watershed, functions, and uses for optimal conservation and economic benefits

with this vision in mind. Additionally the goals and strategies documented in this plan are designed to ensure that they reach the identified vision while serving their mission as stated above.

3.2 Summary of identified concerns

Stakeholder Concerns Summary

During the beginning phases of the plan's development, the Five Lakes watershed stakeholders identified several water quality related concerns in their watershed. Public meetings were the primary avenue for collecting concerns from stakeholders, although the project sponsor and facilitating consultant encouraged stakeholders to contact them with any concerns that stakeholders thought of outside of the meetings. The stakeholders' concerns broadly fit into various categories and are listed below. The order of the concerns listed below does not reflect any prioritization by the stakeholders.

Process

Concerns were expressed about the watershed management planning process. These included bringing together all existing information and making sure that all stakeholders are invited to participate.

- Stakeholders indicated that information was scattered through a number of sources and that a concerted effort needed to be made to gather that information and build on it.
- Stakeholders expressed concern that the Amish community is not involved to participate as a team member and should be.
- Stakeholders indicated that there were a number of studies completed in the late 1980's and mid 1990's, but they were done without public input. Their concern was that without stakeholders' buy-in the book sits on a shelf.
- Stakeholders indicted a need to continue addressing the problems and not blame the problems on other people.
- Stakeholder concluded that we need to investigate the whole picture including people, livestock, farmers, and the watershed.
- Stakeholders thought that the farmers were working with the lake property owners to ensure an even contribution throughout the process.
- Stakeholders expressed a desire for the plan to relate to the whole picture and include information on where are sources of nonpoint and point pollution are located.
- Stakeholders indicated that all stakeholders need to work together to address an all-encompassing perspective.

Information/education

Stakeholders voiced concerns about the amount of education and information available to the general public.

- Stakeholders expressed concern that watershed residents don't understand the problems and felt that it was difficult for residents to visualize how their activities cause problems.
- Stakeholders indicated that incentive-based conservation efforts help, but thought that residents will not implement conservation practices if they do not understand the problem.
- Stakeholders indicated that we should not assume that there is one solution for everyone. They further felt that many people are not involved with the conservation programs because they do not want money with government strings attached.
- Stakeholders felt that more educational efforts were necessary especially related to the over-application of lawn fertilizer.
- Stakeholders expressed a need to look for that teachable moment.

Nutrients

Stakeholders expressed concerns about the amounts and types of nutrients being discharged into the hydrologic system. These concerns included nutrients applied to agricultural and residential lands.

- Stakeholders felt that individuals typically over apply lawn fertilizer and are unaware of its impact.
- Stakeholders indicated that phosphorus loading to watershed waterbodies was excessive.
- Stakeholders thought that the lakes were becoming more eutrophic.
- Stakeholders expressed concern that elevated nutrient levels were reducing oxygen availability.
- Stakeholders indicated concern over the loss of cisco populations and wondered how this related to nutrient levels.
- Stakeholders felt that oxygen levels were dropping due to bacterial activity on nutrients and other oxygen-consuming wastes.
- Stakeholders indicated concern over livestock access to waterbodies and the resultant phosphorus and erosion that occurs along shorelines/streambanks as the animals enters the waterbody.
- Stakeholders felt that runoff promotes algae blooms and leads to excess weed growth.
- Stakeholders indicated concern over the contribution of nitrates from gypsy moths due to their flax.
- Stakeholders indicated concern over phosphorus contributions from geese. These concerns were based on a study completed by Purdue that indicted that phosphorus of four geese is similar to one cow.
- Stakeholders indicated that algae blooms were occurring where they previously did not occur.

Filter strips

Members of the watershed planning team and the public expressed concerns about the removal of natural filter strips along lake fronts and questioned the status of agricultural filter strips along streams and drainage ditches.

- Stakeholders felt that many of these lakefront homeowners have removed the natural shrubbery and want to have grass growing right down to the edge of the water.
- Stakeholders indicated the need to educate landowners about the negative impact of the removal of natural filters next to the lakes
- Stakeholders felt that natural filters were being removed adjacent to streams and should be preserved.

Point source

Concerns were expressed about the contribution of urban runoff for nutrients and sediments. Stakeholders wanted to insure that point sources were identified when possible.

- Stakeholders indicated the urban segment of the watershed and the impacts from storm water runoff from Wolcottville have not been adequately addressed.
- Stakeholders expressed a desire to address point source pollution in addition to non-point source pollution.
- Stakeholders expressed concern over the contribution of the Adams Lake sewer system on water quality.

Sedimentation/erosion

Stakeholders expressed concerns about the erosion of shoreline and streambanks, aggressive ditching, deer crossing stream banks causing erosion.

- Stakeholders expressed concern over the removal of native and resultant erosion of the shoreline.
- Stakeholders felt that ditching is occurring within the watershed and that this practice should be limited.

- Stakeholders felt there was a considerable amount of water draining through the watershed and that much of this water carries excess silt by the time it gets to the lake.
- Stakeholders indicated that islands have started to develop at the mouth of many of the lakes' inlets.
- Stakeholder felt that natural problems, like deer crossings of stream, can create substantial bank erosion.
- Stakeholders felt that Dallas Lake's transparency is poorer than it was previously.

Water level

Concerns were expressed about the changes in the water levels and impacts on water quality and the aquatic environment.

- Stakeholders expressed concern over how changes in the lakes' water levels impact water quality and the aquatic environment.

Values

Stakeholders expressed concerns about maintaining and improving property, aesthetic and recreational values.

- Stakeholders indicated concern over the impact of aesthetics, property values, and health values.
- Stakeholders felt that aesthetic problems result from algae blooms which could translate to lower property values.
- Stakeholders indicated that increased turbidity is a problem for fishing and aesthetics.

Recreation

Members of the watershed planning team and the public expressed concerns about the decreasing surface are of the lakes reducing the amount of the lake available for recreation, declining fish populations, and health concerns for swimming and skiing in contaminated water.

- Stakeholder indicated concern over decreased water surface area and its impact on recreation.
- Stakeholders felt that fish populations could decline due to dropping water levels.
- Stakeholders indicated that game fish populations had declined due to poor water quality.
- Stakeholders indicated concern over lake access issues due to sedimentation on small lakes.
- Stakeholders felt that weed and algae growth were becoming excessive and limiting boating, fishing, and swimming.
- Stakeholders expressed a desire for good water quality for recreation and fishing in the lakes.
- Stakeholders indicated a desire for safe water for recreation purposes.

Health

Concerns were expressed about skin problems due to algae in the water, e. coli, and general concerns about safe and clean water.

- Stakeholders felt that skin problems resulted from algae in water.
- Stakeholders expressed concern over potentially elevated E. coli levels and the impact on health and recreation.

Wildlife

Concerns were expressed about the geese population and their contribution to water degradation.

- Stakeholders indicated a need to control goose populations and limit their negative contribution to water quality.

Land use

Stakeholders were concerned about development involving intensifying land use changes and the potential for future land use to further degrade the watershed.

- Stakeholders felt that development involving intensifying land use changes could negatively impact water quality within the lakes.

Implementation

Stakeholders identified concerns about actually implementing the plan once it is completed. This included financial, social, technical, and political constraints for implementation.

- Stakeholders expressed concern over landowners being willing to implement practices since money has been available in the past and has gone unused.
- Stakeholders felt that an educational effort needed to be implemented to make landowners aware that money is available for implementation.
- Stakeholders indicated the need to develop a plan that can be and will be implemented; specifically they wanted to target a reduction in the destruction of wetlands.
- Stakeholders felt that it was important to identify the relationship of lake and watershed.
- Stakeholders expressed concern over the availability of funding for the implementation of projects.
- Stakeholders indicated that maintenance is typically lacking on the existing sediment traps and requested that a plan be implemented to clean these traps.

Political

Concerns were expressed about increasing governmental regulation in the watershed.

- Stakeholders expressed concern about increasing governmental regulation and its impact on the watershed.

Results

Members of the watershed planning team and the public expressed concerns about the conservation actions identified and implemented in this plan actually causing favorable results.

- Stakeholders indicated that conservation efforts have had near 100% compliance, including no till and buffer strips, yet they feel there is still a need to dredge the silt from the waterways.

Water Quality Sampling Summary

Site 1 Hutchins Ditch

Temperature, pH, conductivity, and turbidity measurements were all within normal ranges for Indiana streams at Hutchins Ditch. Dissolved oxygen concentrations were sufficient to support a healthy biotic community; however, the only recorded supersaturated condition occurred in Hutchins Ditch during the May sampling event. Supersaturated conditions typically arise from two sources: turbulent water traps more oxygen in the water than would typically occur when the stream is in equilibrium with the air, or algae or plants within the stream are photosynthesizing and producing higher than normal levels of dissolved oxygen. In the case of Hutchins Ditch, it is likely that algal material present during the May sampling event contributed to the supersaturated condition.

Some parameter concentrations were elevated within Hutchins Ditch. Neither ammonia-nitrogen nor nitrate-nitrogen concentrations measured at Hutchins Ditch exceeded the state standard. However, nitrate-nitrogen concentrations exceeded the median concentration observed in Ohio streams (1.0 mg/L) known to support healthy warmwater fauna (Ohio EPA, 1999). Hutchins Ditch's nitrate-nitrogen

concentrations were greater than this threshold level during both the May (1.819 mg/L; storm) and July (2.423 mg/L; storm) sampling events. In fact, nitrate-nitrogen concentrations measured in Hutchins Ditch were among the highest recorded at sites in the Five Lakes Watershed during JFNew's sampling effort. Hutchins Ditch also contained the highest soluble reactive phosphorus (SRP) concentration measured in the Five Lakes Watershed. This measurement (0.097 mg/L) was recorded during the September 7, 2004 base flow event. During three of the four sampling events, total phosphorus concentrations were also elevated within Hutchins Ditch exceeding the level (0.1 mg/L) at which the Ohio EPA (1999) observed impairment in the aquatic biota. Concentrations in excess of this threshold ranged from 0.172 mg/L during the May sampling event (storm) to 0.292 during the September 7 sampling event (base). *E. coli* concentrations measured in Hutchins Ditch exceeded the state standard (235 colonies/100 mL) during three of the four sampling events. Hutchins Ditch possessed the highest *E. coli* concentration observed during JFNew's assessment measuring nearly 100 times the state standard (33,000 colonies/100 mL).

Although most of the pollutant loads were generally low within Hutchins Ditch when compared with the other watershed streams, Hutchins Ditch exhibited the highest ammonia-nitrogen, nitrate-nitrogen, total Kjeldahl nitrogen, and total suspended solids areal loading rate during storm flow. Areal loading rate is the pollutant loading rate divided by drainage area. This allows for a comparison of loading rates in different sized drainages. Normally, pollutant loading rates in larger drainages are expected to be higher than pollutant loading rates in smaller drainages. Hutchins Ditch also possessed the second highest soluble reactive and total phosphorus areal loading rates during base and storm flow and the third highest total Kjeldahl nitrogen and total suspended solids areal loading rates during base flow. The high (relative to other streams) sediment and nutrient loading rates suggest that the stream may carry a significant sediment load and/or stream erosion may be a source of sediment in the ditch.

The evaluation of Hutchins Ditch's biological community indicates that the ditch contains a quality biotic community despite its poor water quality and limited habitat. Hutchins Ditch received the highest mIBI score (5.2 of 8 total points). This score suggests that the stream is fully supporting for its aquatic life use designation as determined by the IDEM. Hutchins Ditch contains a good variety and number of moderately tolerant families (taxa) which represent this slightly impaired community. However, the habitat within Hutchins Ditch was relatively poor scoring only 37 of 100 total points. The stream possessed poor substrate, limited channel development, and lacked pool and riffle complexes. Based on this habitat score, it is likely that IDEM would rate Hutchins Ditch as non-supporting for its aquatic life use designation.

Site 2 Uhl Ditch

In general, water quality within Uhl Ditch was relatively good when compared to other streams in the watershed; however, there were some parameters of concern. Temperature, pH, conductivity, and dissolved oxygen measurements were all within normal ranges for Indiana streams at Uhl Ditch. Turbidity concentrations were elevated during the July storm event exceeding the USEPA (2000) recommended concentration (9.88 NTU). The turbidity level observed in Uhl Ditch was the highest of any of the Five Lakes watershed streams. Ammonia-nitrogen and total Kjeldahl nitrogen concentrations were within typical ranges observed in Indiana streams. Nitrate-nitrogen concentrations exceeded the median concentration observed by the Ohio EPA to support healthy biota during both the May (2.005 mg/L) and July (2.145 mg/L) storm events. Soluble reactive and total phosphorus concentrations were also elevated during the assessments. Total phosphorus concentrations exceeded median concentrations observed by the Ohio EPA required to protect aquatic biota during the July (0.166 mg/L) storm event

and the September 7 (0.111 mg/L) base flow sampling event. Total suspended solids concentrations were elevated during the storm events but did not exceed levels that are deleterious to aquatic biota (80 mg/L; Waters, 1995). However, *E. coli* concentrations were elevated during three of the four sampling events. Concentrations ranged from 156 colonies/100 mL during the May storm event to 7,000 colonies/100 mL during the July storm event. Concentrations exceeding the state standard were 1.2 to 21.5 times the standard concentration. Uhl Ditch also contained the highest soluble reactive areal loading rate during base flow. Uhl Ditch contained a severely impaired biotic community (mIBI score of 1.6); however, the ditch contained the highest quality habitat (QHEI score of 51) of any of the watershed streams. Macroinvertebrate community and habitat scores suggest that IDEM would consider Uhl Ditch to be non-supporting (biota) to partially supporting (habitat) for its aquatic life use designation.

Site 3 Cree Lake Outlet

Compared with other streams in the watershed, the Cree Lake Outlet possessed relatively poor water quality. Dissolved oxygen concentrations were low during all four assessments ranging from 1.4 mg/L during the September 21 base flow event to 6.6 mg/L during the September 7 base flow event. Only the dissolved oxygen concentration measured on September 21 fell below the Indiana state standard. Dissolved oxygen saturation was also generally low during the sampling events. Water saturation ranged from 14% to 78% during the four events. Ammonia-nitrogen and total Kjeldahl nitrogen concentrations were also elevated in the Cree Lake Outlet. Ammonia-nitrogen concentrations ranged from 0.050 mg/L during the July storm event to 0.966 mg/L during the September 21 base flow event. TKN concentrations ranged from 1.089 mg/L during the September 7 base flow event to 2.372 mg/L during the September 7 base flow event. These concentrations suggest that organic and particulate material may be limiting use of this tributary. The Cree Lake Outlet also possessed elevated soluble reactive and total phosphorus concentrations. SRP concentrations ranged from 0.043 mg/L during the September 7 sampling event to 0.088 mg/L during the September 21 event. During all four sampling events, total phosphorus concentrations exceeded levels that Dodd et al. (1998) determined to occur in eutrophic streams and levels that the Ohio EPA (1999) determined were necessary for the high quality aquatic biota communities. Total phosphorus concentrations ranged from 0.092 mg/L during the May storm event to 0.323 mg/L during the September 7 base flow event. Total suspended solids concentrations were also elevated in the Cree Lake Outlet ranging from 7.25 mg/L during the May event to 20 mg/L during the July event. *E. coli* concentrations exceeded the Indiana state standard during all four sampling events; concentrations ranged from 430 colonies/100 mL on September 7 to 7,000 colonies/100 mL the July storm event.

The Cree Lake Outlet also possessed elevated nutrient and sediment loading rates. Nitrate-nitrogen, total Kjeldahl nitrogen, soluble and total phosphorus, and total suspended solids loading rates were higher in the Cree Lake Outlet than at any other site during the July storm event. The Cree Lake Outlet contained the highest ammonia-nitrogen load during the September 21 base flow event and the second highest ammonia-nitrogen areal load for base flow. Overall, soluble reactive phosphorus and total suspended solids loading rates at the Cree Lake outlet were higher than all but one site during the storm events. Likewise, total suspended solids areal loading rates exceeded those measured at all but one site during storm events.

The macroinvertebrate community present in the Cree Lake outlet reflects the poor water quality present within this stream. The Cree Lake Outlet macroinvertebrate community scored the lowest mIBI score (0.8) of any of the watershed streams. This stream possessed a prevalence of tolerant families,

none of which represent the more intolerant mayfly, stonefly, or caddisfly families. Additionally, the lowest number of different families was observed at the Cree Lake Outlet. It is likely that IDEM would classify this severely impaired biotic community as non-supporting for its aquatic life use designation. The poor habitat present at this site likely contributes to the limited biotic community observed in the Cree Lake Outlet.

Site 4 South Milford Tributary

The South Milford Tributary is an intermittent stream that drains the entirety of South Milford Watershed. As an intermittent stream, this tributary does not contain water throughout the growing season as evidenced by Figure 20. Base flow water chemistry samples were not collected from the South Milford Tributary due to its lack of flowing water and later in the summer, its lack of water in general. Because base flow water chemistry samples were not collected from this site, only its conditions during storm flow events (May and July) could be assessed.

During storm flow, temperature, dissolved oxygen, pH, conductivity, and turbidity levels within the South Milford Tributary were typical for Indiana streams. The turbidity concentration measured during the May event (10 NTU) exceeded the USEPA (9.98 NTU; USEPA, 2000) recommended criteria. Ammonia-nitrogen and total Kjeldahl nitrogen concentrations were also within ranges typical of Indiana streams. Nitrate-nitrogen concentrations were elevated within the South Milford Tributary. Concentrations exceeded the median level determined by the Ohio EPA (1999) for the protection of aquatic biota. In fact, the concentration measured in May (3.112 mg/L) was the highest of any of the measurements recorded in the Five Lakes watershed streams. Soluble reactive and total phosphorus concentrations were also elevated during both storm events. Total phosphorus concentrations ranged from 0.125 mg/L during the May event to 0.220 mg/L during the July event. Both concentrations exceeded the level determined by Ohio EPA as necessary for the protection of aquatic biota. *E. coli* concentrations exceeded the Indiana state standard during both sampling events. Concentrations ranged from 530 colonies/100 mL in May to 5,000 colonies/100 mL in July. The South Milford Tributary possessed the highest soluble reactive and total phosphorus areal loading rates and the second highest nitrate-nitrogen and total Kjeldahl nitrogen areal loading rates for the storm event sampling.

The South Milford Tributary possessed the poorest habitat of any of the Five Lakes watershed streams scoring a 24 of a possible 100 points. Poor substrate, limited channel development, lack of instream cover, and non-existent pool-riffle complexes limited habitat availability in this stream. Based on this QHEI score, the South Milford Tributary would likely be rated as non-supporting for its aquatic life use designation by the IDEM. The lack of water during base flow, poor water quality during storm flow, and limited habitat likely impair the stream's biotic community. The mIBI score at this site was 1.2. The macroinvertebrate community present in the South Milford Tributary was dominated by midges of the family Chironomidae; a majority of these individuals were actually blood midges, a taxon common in streams with poor water quality and low dissolved oxygen levels.

Site 5 Upper Little Elkhart Creek

Temperature, pH, conductivity, and turbidity concentrations were within normal ranges for Indiana streams. However, dissolved oxygen concentrations at the Upper Little Elkhart Creek sampling site were below the Indiana state standard during three of the four sampling events. Concentrations below the standard ranged from 2.4 mg/L during the September 7 sampling event to 4.9 mg/L during the September 21 sampling event. The stream contained sufficient oxygen to support aquatic biota during only the May sampling event. Like most of the streams in the Five Lakes watershed, nitrate-nitrogen

concentrations at the Upper Little Elkhart Creek sampling site exceeded the level at which the Ohio EPA determined that biotic communities may become impaired during the May storm event (1.669 mg/L). Concentrations measured during the other three events ranged from 0.305 mg/L during the July event to 0.661 during the September 21 sampling event. Ammonia-nitrogen and total Kjeldahl nitrogen concentrations were relatively normal comparable to those measured in Indiana streams. However, soluble reactive and total phosphorus concentrations were elevated at this sampling site during all four events. Total phosphorus concentrations (0.125 mg/L) exceeded the median concentration for the protection of aquatic biota (Ohio EPA, 1999) during the July storm event. *E. coli* concentrations ranged from 120 colonies/100 mL during the May storm event to 1,050 colonies/100 mL during the July storm event. *E. coli* concentrations exceeded the Indiana state standard during only two events which measured 1.2 to 3.5 times the state standard.

Loading rates within the Upper Little Elkhart Creek sampling site were also elevated. This site possessed the highest ammonia-nitrogen load during the July storm event and the highest total suspended solids load during the September 21 base flow event. The second highest soluble reactive phosphorus (July), total phosphorus (May and July), and nitrate-nitrogen (May) loading rates were also measured at this site.

The macroinvertebrate community reflects the poor water quality present at the Upper Little Elkhart Creek site. The mIBI score was 1.2, which suggests that the stream's macroinvertebrate community was severely impaired at the time of sampling. This stream site supported the most diverse macroinvertebrate community of any of the watershed streams. However, like most streams in the Five Lakes watershed, the families present in the stream were extremely tolerant to poor water quality conditions. The relatively good habitat (46 of 100 points) present at this site suggests that poor water chemistry may play a larger role in the macroinvertebrate community then the limited habitat. Nonetheless, it is likely that IDEM would rate both the habitat and the macroinvertebrate community as non-supporting of their aquatic life use designation.

Site 6 Adams Lake Outlet

The Adams Lake Outlet stream possessed relatively good water quality when compared with other watershed streams. Temperature, dissolved oxygen, turbidity, conductivity, pH, nitrate-nitrogen, ammonia-nitrogen, and total Kjeldahl nitrogen concentration were all within ranges typical for Indiana streams. However, soluble reactive and total phosphorus concentrations were elevated in the Adams Lake Outlet. Total phosphorus concentrations ranged from 0.049 mg/L during the September 7 sampling event to 0.113 mg/L during the September 21 sampling event. Only the September 21 total phosphorus concentration exceeded the level determined by the Ohio EPA for the protection of aquatic life. The Adams Lake Outlet possessed the highest total suspended solids concentration measured in the watershed streams (33.23 mg/L on September 21). *E. coli* concentrations within the Adams Lake Outlet were relatively low compared to other streams in the watershed. *E. coli* concentrations ranged from 186 colonies/100 mL during the September 21 sampling event to 450 during the July storm event. Poor substrate, riparian quality, and pool-riffle complex development limited habitat in the Adams Lake Outlet. (This site scored 37 of 100 possible points.) Although this site possessed the second highest mIBI score (2.4) of the watershed streams, the macroinvertebrate community reflects the poor habitat and limited water quality present within this stream. The QHEI and mIBI scores suggest that the IDEM would consider the Adams Lake Outlet non-supporting for its aquatic life use designation.

Site 7 Lower Little Elkhart Creek

Temperature, pH, conductivity, and turbidity levels present at the Lower Little Elkhart Creek sites were

comparable to those measured in Indiana streams. Dissolved oxygen concentrations were adequate to support aquatic biota. Ammonia-nitrogen and total Kjeldahl nitrogen concentrations were relatively low compared to other watershed streams. Nitrate-nitrogen concentrations in the Lower Little Elkhart River were also relatively low; however, the concentration measured during the July storm event (1.153 mg/L) exceeded the level determined by the Ohio EPA (1999) for the protection of aquatic biota. Soluble reactive and total phosphorus concentrations were also relatively low compared to other watershed streams. Soluble reactive phosphorus concentrations ranged from 0.018 mg/L during the September 21 sampling event to 0.034 mg/L during the September 7 sampling event, while total phosphorus concentrations ranged from 0.065 mg/L during the September 21 sampling event to 0.103 mg/L during the July storm event. *E. coli* concentrations were elevated within the Lower Little Elkhart Creek ranging from 335 colonies/100 mL during the May event to 17,000 colonies/100 mL during the July storm event. This was the second highest *E. coli* concentration measured in the Five Lakes watershed. The Lower Little Elkhart Creek reach possessed relatively good habitat scoring 50 of 100 points and a relatively good macroinvertebrate community (2 of 8 points) when compared with other watershed streams. However, the IDEM would likely consider the stream non-supporting for its aquatic life use designation as determined by its mIBI and QHEI scores.

As is expected of the stream with the largest drainage area, Lower Little Elkhart Creek possessed relatively high pollutant loads compared with other watershed streams. This stream contained the highest nitrate-nitrogen (May; September 7; September 21), ammonia-nitrogen (May), soluble reactive phosphorus (May; September 7; September 21), and total phosphorus (May; September 7; September 21) loading rates. This stream also possessed the second highest total Kjeldahl nitrogen (May; July; September 7; September 21), total suspended solids (May; July; September 7), and ammonia-nitrogen (September 7) loading rates and the second highest nitrate-nitrogen and total Kjeldahl nitrogen areal loading rates during base flow.

Site 8 Oliver Lake Outlet

Temperature, turbidity, conductivity, and pH levels measured in the Oliver Lake Outlet were all comparable to levels measured in other Indiana streams. Typically, dissolved oxygen concentrations provided sufficient oxygen for aquatic biota; however, the dissolved oxygen concentration, measuring 4.9 mg/L, was below the state standard during the September 7 sampling event. Ammonia-nitrogen concentrations were relatively high compared with other watershed streams, but concentrations did not exceed state standards. Nitrate-nitrogen, total Kjeldahl nitrogen, soluble reactive phosphorus, and total phosphorus concentrations were relatively low compared to other streams in the watershed. *E. coli* concentrations exceeded the state standard during three of the four sampling events. Concentrations ranged from 43 colonies/100 mL during the September 21 sampling event to 880 colonies/100 mL during the July storm event.

The stream's macroinvertebrate community was relatively good compared to other watershed streams; however, the stream's habitat was relatively poor. The mIBI score (2 of 8 points) ranked the Oliver Lake Outlet as third among watershed streams; while the QHEI score (38 of 100 points) placed the stream fourth. Poor substrate and lack of pool-riffle development limited habitat at the Oliver Lake Outlet.

Watershed Survey

Identifying areas of concern and selecting sites for future water quality improvement projects were the goals for this visual and watershed inspection. The Five Lakes watershed was toured twice throughout the completion of the watershed management plan. Inspections and tours included a stream crossing

survey completed in September 2002 and several watershed walking and windshield tours completed in June of 2004 and July of 2005.

Concerns and sources of pollutants associated with the 8 water quality sampled sites, the existing data available for that site and suggested management practices for respective sites. All nutrient information is based on nitrate-nitrogen and phosphorus is based on total phosphorus.

Site	Concern/Source	Existing Data	Suggested Management Practice
S1	-Eroding waterways and use of improper tillage methods -Sediment and nutrient and phosphorous input from gravel roads, fields and impaired wetlands	**Nutrients** (based on N03-N) Violates Accepted Threshold: 05/18/04 (storm flow), 07/22/04 (storm flow) **Phosphorus** (Based on TP mg/l) Violates Accepted Threshold: 07/22/04 (storm flow), 09/07/04 (base flow) **E. Coli Bacteria** Violates State Standard: 07/22/04 (storm flow), 09/07/04 (base flow), 09/21/04 (base flow)	-Grass waterways and use correct tillage methodology -Wetland restoration below corn field -Install a berm to reduce sediment input into creek/stream from road -WASCOB to check flow off field; use grass waterways as well -Install buffer strip and restore wetland -Install buffer strip -Restore 8 wetland areas to reduce flow velocities at upper end and restore two wetlands at scattered sites
S2	Erosion	**Phosphorus** (Based on TP mg/l) Violates Accepted Threshold: 07/22/04 (storm flow), 09/07/04 (base flow) **E. Coli Bacteria** Violates State Standard: 05/15/04 (storm flow), 07/22/04 (storm flow), 09/07/04 (base flow), 09/21/04 (base flow) **Erosion and sedimentation** (based on TSS and Turbidity) Violates Accepted Threshold: 07/12/04 (storm flow for Turbidity)	-Install buffer strips -Limit impact of gravel roads to streams at crossings
S3	- Manure and erosion due to sheep and cattle access to stream - P-loading of Cree Lake and potential problems with septic systems on the lake (11) -Stream bank erosion	**Oxygen consuming wastes** (based on DO mg/l) Violates State Standard: 09/21/04 (base flow) **Nutrients** (based on N03-N) Violates Accepted Threshold: 05/18/04 (storm flow), 07/22/04 (storm flow) **Phosphorus** (Based on TP mg/l) Violates Accepted Threshold: 05/18/04 (storm flow), 07/22/04 (storm flow), 09/07/04 (base flow) **E. Coli Bacteria** Violates State Standard: 05/15/04 (storm flow), 07/22/04 (storm flow), 09/07/04 (base flow), 09/21/04 (base flow) **Erosion and sedimentation** (based on TSS and Turbidity) Violates Accepted Threshold: 07/12/04 (storm flow for Turbidity)	- Review grazing management for cattle and sheep - Potential installation of mounded septic systems - Stream bank stabilization - Installation of grassed water ways and grade control structures - Maintain no-till or mulch-till and haying practices in this area -Install a WASCOB on drainage to Shockopee
S4	-Stormwater issues	**Nutrients** (based on N03-N) Violates	-Determine stormwater/wastewater

Site	Concern/Source	Existing Data	Suggested Management Practice
		Accepted Threshold: 05/18/04 (storm flow), 07/22/04 (storm flow) **Phosphorus** (Based on TP mg/l) Violates Accepted Threshold: 07/22/04 (storm flow) **E. Coli Bacteria** Violates State Standard: 07/22/04 (storm flow) **Erosion and sedimentation** (based on TSS and Turbidity) Violates Accepted Threshold: 07/12/04 (storm flow for Turbidity)	impacts from South Milford -Implement stormwater BMPs as necessary
S5	No specific concerns identified	**Oxygen consuming wastes** (based on DO mg/l) Violates State Standard: 09/07/04 (base flow), Violates Accepted Threshold: 07/22/04 (storm flow), 09/21/05 (base flow) **Nutrients** (based on N03-N) Violates Accepted Threshold: 05/18/04 (storm flow) **Phosphorus** (Based on TP mg/l) Violates Accepted Threshold: 07/22/04 (storm flow) **E. Coli Bacteria** Violates State Standard: 05/15/04 (storm flow), 07/22/04 (storm flow), 09/07/04 (base flow)	-All practices installed upstream in S1-S4 subwatersheds should positively impact water quality. -Identify additional projects (wetland restoration)
S6	-Ditch problems through barn yard	**E. Coli Bacteria** Violates State Standard: 05/15/04 (storm flow), 07/22/04 (storm flow), 09/07/04 (base flow)	-Install grassed waterways in fields to Blackman Lake - Review BMP for buffalo in this area
S7	-No specific problems identified	**Nutrients** (based on N03-N) Violates Accepted Threshold: 05/18/04 (storm flow) **Phosphorus** (Based on TP mg/l) Violates Accepted Threshold: 07/22/04 (storm flow) **E. Coli Bacteria** Violates State Standard: 05/15/04 (storm flow), 07/22/04 (storm flow), 09/07/04 (base flow), 09/21/04 (base flow)	
S8	-No specific projects identified	**Oxygen consuming wastes** (based on DO mg/l) Violates Accepted Threshold: 09/07/04 (base flow) **E. Coli Bacteria** Violates State Standard: 07/22/04 (storm flow), 09/07/04 (base flow)	-Determine potential impact of old landfill -Review impact of development of shoreline areas (Oliver, Olin, Martin lakes)

List of locations where the application of best management practices would improve water quality in the Five Lakes watershed as identified during the road stream crossing, water sampling and photo surveys.

Site	Concern	Suggested Management Practice
1	Livestock access to stream	Fence livestock from stream and correct drainage from pasture
2	Sediment loading from adjacent gravel road	Installation of a berm to reduce sediment input into creek/stream
3	Lack of buffer strip	Install buffer strips and restore wetland
4	Sediment loading from agricultural fields	Install grassed waterways and use correct tillage method
5	Lack of buffer strip on Uhl Ditch	Install buffer strip on Uhl Ditch
6	Grazing management issues; livestock access to creek	Fence livestock from stream
7	Sediment traps above Cree Lake require cleaning	Clean sediment traps
8	Bank erosion	Stabilize bank
9	Sheep in creek	Fence sheep out of creek
10	Possible livestock access to stream	Fence livestock out of stream and woods
11	Sediment and nutrient loading	Increase crop cover and manure management south of inlet to Adams Lake
12	ICM, nutrient and manure management issues	Less structural practices and more cover crop and management; grassed waterways
13	Stream bed and bank erosion	Install grade control at downstream end; seed and restore stream channel
14	Potential for wetland restoration	Restore wetland
15	Sediment and nutrient loading	Install filter strip on drainage to Dove Creek on the upstream end only
16	Lack of buffer strip	Install buffer strips on drainage to Oliver Lake
17	Potential site for wetland restoration	Restore wetland
18	Potential site for wetland restoration	Restore wetland
19	Gravel road potentially drains into the stream	Investigate options for stormwater filtration
20	The buffer strip is too narrow	Narrow buffer strip
21	Erosion control at construction site	Implement erosion control
22	Grazing management issues; livestock access to creek	Fence livestock from stream
23	Erosion	Grass waterways
24	Ditch problems through barnyard	Fence livestock from stream

Site	Concern	Suggested Management Practice
25	Elevated *E. coli* and nutrients	Determine if septic systems need improvement
26	Storm drain concerns	Improve storm drainage issue at Witmer Lake

3.3 Summary of Action Plan

Five goals and corresponding objectives were identified by stakeholders in the process of developing the Five Lakes watershed management plan. These goals and objectives are as follows:

Goal 1: Reduce phosphorus loads to streams from 2004 levels by 50% to reach recommended phosphorus concentrations of < 0.075 mg/L (Dodd et al., 1998) by 2015.
Objective 1: Exclude livestock from stream bank and lakeside access.
Objective 2: Implement stream bank stabilization.
Objective 3: Reduce geese populations on lakeshore properties.
Objective 4: Implement wetland restoration, if feasible, and maintain the existing sediment traps upstream of the Five Lakes.
Objective 5: Promote the usage of alternative fertilizers and/or the reduction in use of fertilizer.
Objective 6: Educate lakeshore residents about what they can do to reduce nutrient loading to the lake.
Objective 7: Work with county sanitarian to identify any failing septic systems and promote proper septic system maintenance in the watershed. Work with lake associations throughout the watershed to implement sewer systems, where possible.
Objective 8: Reduce contamination from urban sewage system infrastructure.
Objective 9: Enroll willing landowner in the CRP program, review farmland in CRP program, and promote other practices to reduce phosphorus loads to streams.
Objective 10: Identify and map all surface and subsurface drains that discharge to the Five Lakes and their tributaries
Objective 11: Quantify pollutant (sediment, nutrients, and bacteria) loads from all storm drains that discharge to the Five Lakes and other lakes within the watershed.
Objective 12: Monitor the phosphorus load of each of the eight stream sampling sites used during the development of this plan and total phosphorus concentration in each of the Five Lakes.

Goal 2. Reduce total suspended solid loads to streams from 2004 levels by 50% by 2015.
Objective 1: Exclude livestock from stream bank and lakeside access.
Objective 2: Implement stream bank stabilization.
Objective 3: Implement wetland restoration.
Objective 4: Enroll willing landowner in the CRP program, review farmland in CRP program, and promote other practices to reduce sediment loads to streams.
Objective 5: Reduce contamination from storm water and sewer system infrastructure.
Objective 6: Reduce erosion from active construction sites.
Objective 7: Work with Lagrange and Noble County officials to increase awareness of any proposed development within the Five Lakes watershed.
Objective 8: Encourage county officials to maintain vegetated riparian buffer along legal drains and to reduce the use of chemical applications along Five Lakes' waterbodies.
Objective 9: Monitor the sediment load of each of the eight stream sampling sites used during the development of this plan and water clarity (Secchi disk transparency) in each of the Five Lakes.

Goal 3. Reduce E. coli concentrations in waterbodies in the Five Lakes watershed so that water within the streams and lakes meets the Indiana state standards of 235 colonies/100 ml by 2015.
Objective 1: Learn more about identifying the sources of *E. coli* from the Total Maximum Daily Load development process for the Elkhart River. (The Elkhart River is on the 303(d) list for *E. coli* contamination.)
Objective 2: Publicize Best Management Practices available to reduce pathogenic contamination of the Five Lakes watershed waterbodies.
Objective 3: Monitor the *E. coli* load of each of the watershed stream sampling sites as used for development of this plan.

Goal 4. Within four years, 50% of landowners within the Five Lakes watershed will learn and/or implement at least one water quality improvement practice/technique on his/her own property.
Objective 1: Establish a core group of individuals willing to work together to generate interest in the watershed management plan, coordinate implementation of the plan, and discuss watershed management issues and water quality concerns in the watershed.
Objective 2: Organize and hold one annual field day highlighting the value of the streams and lakes in the Five Lakes watershed and how to protect the water quality and aquatic life of the watershed.
Objective 3: Publicize the value of the Five Lakes watershed, its waterbodies, and of ways to protect its water quality and aquatic life through various forms of media.
Objective 4: Work with the NRCS, SWCD, and agricultural property owners in the watershed to promote water quality Best Management Practice in the watershed.
Objective 5: Work with the NRCS, SWCD, and residential property owners in the watershed to promote residential water quality Best Management Practices in the watershed.
Objective 6: Establish and maintain a watershed and water quality education table at the Lagrange and Noble County Fairs.
Objective 7: Develop a volunteer monitoring network through Hoosier Riverwatch.
Objective 8: Develop a volunteer monitoring network through the Indiana Clean Lakes Program.

Goal 5. Maintain and improve the recreational setting of the Five Lakes watershed by developing and implementing a recreational management plan within five years.
Objective 1: Develop an aquatic plan management plan and implement the recommendations defined in that plan.
Objective 2: Develop a boating use/recreation plan. A number of items should be included in this plan. The following sub-objectives outline just some of the information necessary to address boating issues on the Five Lakes.
Sub-Objective 2-A: Determine the number of users that are appropriate for the Five Lakes.
Sub-Objective 2-B: Educate lakeshore residents and lake users in regards to Indiana's boating laws and develop a plan to ensure compliance with these laws.
Sub-Objective 2-C: Educate lake users on the negative impacts (agitation and resuspension of sediment and nutrients from the lakebed) of boating in shallow waters.
Sub-Objective 2-D: Address fuel contamination issues, which result from boats with poorly maintained or older engines and also occur during refueling.
Sub-Objective 2-E: Track the impact of group piers, funneling, and boating speed limits on lakes throughout northern Indiana. Participate in efforts of the Lagrange County Lakes Council and the Indiana Lakes Management Society to reduce the negative impact of these items on lakes throughout the county and state.
Objective 3: Monitor and improve the fish community within the Five Lakes and other lakes within the

Five Lakes watershed.
Objective 4: Determine the amount of accumulated sediment at the mouth's of inlets throughout the watershed and develop a plan to remove this accumulated sediment.

3.4 Overall project summary

In addition to identifying concerns and developing an action plan to address theses concerns, the Five Lakes watershed management plan included a detailed description of the watershed and a monitoring plan to measure the success of the stakeholder's action. The most important result of Five Lakes watershed management plan development, however, was the collective effort that went into creating this plan. Stakeholders will use this cooperative momentum created during the development of the plan to implement the plan.

4.0 SUCCESSES AND FAILURES

4.1 Successes: Maintaining the interest of a key group of watershed stakeholders was a great success. Also, generating the interest of the county planning commission and their participation in this effort was also a key success.

4.2 Failures: It proved difficult to keep generated stakeholder interest and, once generated, to maintain stakeholder interest. A core group of watershed stakeholders attended all of the meetings; however, many individuals that initially attended meetings did not return. In total, less than 10% of the individuals living in the Five Lakes watershed participated in the watershed planning effort. Future efforts will focus on education and outreach among the individuals that did not participate.

5.0 FUTURE ACTIVITIES

5.1 Under the direction of the Five Lakes Conservation Association, implementation of some of the goals outlined in the Five Lakes Watershed Plan has begun. As the first necessary goal, Five Lakes Conservation Association, has investigated opportunities for the formation of a watershed group. Also, efforts have begun to address local groups and lake associations to generate their input and interest.

5.2 To address Goals 1, 2, 3, and 5, the FLCA has taken advantage of recent grant opportunities. They applied for LARE funding to begin the design of a number of projects including efforts to stabilize streambanks, fence livestock, and restore buffers along the primary streams in the watershed. Additionally, LARE funding was applied for a received to begin aquatic plant management planning. A number of lake associations including the FLCA, Adams Lake Association, Atwood Lake Association and Cree Lake Association received similar grants. Other grant opportunities are also being explored.